

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number  
**WO 2004/106349 A1**

(51) International Patent Classification<sup>7</sup>: C07F 9/02, 9/38

(21) International Application Number:  
PCT/US2004/016431

(22) International Filing Date: 21 May 2004 (21.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/473,870 27 May 2003 (27.05.2003) US

(71) Applicant (for all designated States except US): E.I.  
DUPONT DE NEMOURS AND COMPANY [US/US];  
1007 Market Street, Wilmington, Delaware 19898 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): YANG, Zhen-Yu  
[CN/US]; 177 Thompson Drive, Hockessin, Delaware  
19707 (US).

(74) Agent: FICKES, Daphne, P.; E.I. du Pont de Nemours  
and Company, Legal Patent Records Center, 4417 Lan-  
caster Pike, Wilmington, Delaware 19805 (US).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,  
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

**Published:**

- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: FUEL CELL MEMBRANE CONTAINING ZIRCONIUM PHOSPHATE

(57) Abstract: The present invention provides for a compound having the following structure:  $Zr(O_3PZ_qY_nX)_2(03PR)_m$ , wherein X = a functional group such as  $CO_2H$ ,  $PO(OH)_2$ , and  $SO_3H$ , and  $SO_2NHSO_2W$ , wherein W = aryl of 6 to 10 carbon atoms or Y; Y = perfluoro-linear, branched or cyclic alkylene group, wherein the alkylene is 1-20 carbon atoms, or a fluorinated group containing at least one substituent selected from the group consisting of oxygen, chlorine and bromine; Z = alkylene of 1-12 carbon atoms, aryl of 6-10 carbon atoms, or a heterocyclic aryl group of 3-10 carbons atoms; R = alkyl of 1-12 carbon atoms, aryl of 6-10 carbon atoms, substituted alkyl, or substituted aryl, wherein the substituent is selected from the group consisting of F, Cl, perfluoroalkyl, alkyl of 1-12 carbon atoms and aryl of 6-10 carbon atoms; n = 0 or 1; q = 0 or 1; and m = 0 to 1.5; with the proviso that when n = 0, and q = 1, Z = at least one heterocyclic group having 3 to 10 carbon atoms, 1 to 5 nitrogen atoms and 0 to 4 oxygen atoms. The invention also provides a polymer electrolyte membrane, a catalyst coated membrane and a fuel cell having this compound.

WO 2004/106349 A1